

Thylamys elegans.

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Thylamys Gray, 1843

Thylamys Gray, 1843:101. Type species *Didelphis elegans* Waterhouse, 1839, by monotypy.

CONTEXT AND CONTENT. Order Didelphimorphia, Family Didelphidae, Subfamily Thylamyinae (Kirsch and Palma, 1995). The genus *Thylamys* contains six species: *T. elegans*, *T. macrura*, *T. pallidior*, *T. pusilla*, *T. velutinus*, and *T. venusta* (Gardner, 1993; Palma, 1994). A key to species of *Thylamys* (modified from Tate, 1933) follows (measurements in mm):

- 1 Total length >270; length of tail usually >145; condylobasal length >32; no evidence of incrassation in tail *T. macrura*
Total length <270; length of tail <145; condylobasal length <32; evidence of incrassation in tail (tail swollen) 2
- 2 Tail shorter than body (usually <85); length of ear <20; ventral pelage buffy-brown and gray basally *T. velutinus*
Tail longer than body (>85); length of ear >20; ventral pelage white or creamy white, may or may not be gray basally 3
- 3 Ventral pelage creamy white, never gray basally; length of hind foot <14 *T. pusilla*
Ventral pelage white and gray basally; length of hind foot >14 4
- 4 Dorsal pelage predominantly grayish; auditory bullae greatly inflated; zygomatic breadth <14; nasal length <12 *T. pallidior*
Dorsal pelage brownish; bullae not greatly inflated; zygomatic breadth >14; nasal length >12 5
- 5 Dorsal pelage pale brown; ventral pelage whitish, gray basally; basal length >26 *T. elegans*
Dorsal pelage dark brown; ventral pelage yellowish-gray basally; basal length <26 *T. venusta*

Thylamys elegans Waterhouse, 1839

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Didelphis elegans Waterhouse, 1839:95. Type locality "Valparaiso," Valparaiso, Chile.

Thylamys elegans: Gray, 1843:101. First use of name combination. *Didelphys soricina* Philippi, 1894:36. Type locality "Valdivia," Valdivia, Chile.

Marmosa tatei Handley, 1956:402. Type locality "Chasquitambo," Ancash, Peru.

CONTEXT AND CONTENT. Context same as for genus. Three subspecies of *T. elegans* are recognized (Gardner, 1993):

T. e. elegans (Waterhouse, 1839:95), see above.

T. e. coquimbensis Tate, 1931:14. Type locality "Paiguano," Coquimbo, Chile.

T. e. soricina Philippi, 1894, see above.

DIAGNOSIS. *Thylamys elegans* externally resembles congeneric species that inhabit dry open areas (*T. pallidior*, *T. pusilla*, *T. venusta*). Nevertheless, the species is differentiated because of its large size (usually >30 mm), seasonally incrassated tail (Fig. 1), highly fenestrated palate, dense and slightly brownish fur, haired feet, and long vibrissae (Mann, 1978). *T. elegans* differs from *T. pusilla* in having a longer rostrum and narrower zygomatic breadth relative to condylobasal length (Fig. 2). It differs from *T. pallidior* by shorter pelage, larger size, larger feet, and longer tail. The skull of *T. pallidior* is smaller, has larger bullae, and a shorter rostrum than the skull of *T. elegans*. *T. elegans* differs from *T.*

venusta by the greater size of the skull, greater condylobasal length, and a venter of yellowish hairs that are gray basally.

GENERAL CHARACTERS. *Thylamys elegans* has the coloration pattern characteristic of the genus: a wide dark brown stripe along the dorsal part of the body, light brown to the sides, and a light venter (Mann, 1978; Tate, 1933). The fur is dense and velvety, the eye rings are black and extend toward the nose, the ears are large and naked, the feet are white, and the canines are widely separated. The tail is slightly longer than the head and body, strongly bicolored when not incrassated, and finely haired throughout (Osgood, 1943; Tate, 1933). The base of the tail can be ca. 1 cm in diameter during incrassation; near the junction with the body there is a slight constriction (Tate, 1933). *Thylamys e. coquimbensis* is noticeably paler than *T. e. elegans*, the gray base of the ventral pelage is only slightly developed, eye rings are more narrow (ca. 0.5 mm in width), and feet are covered on their dorsal surfaces with very short white hairs (Tate, 1933). *Thylamys e. soricina* (observations made on a young specimen) is darker than *T. e. elegans* dorsally; the upper surface of the tail is blackish while the underside is pale (Tate, 1933). The ventral pelage of *T. e. soricina* is buffy in contrast to the white hairs of *T. e. elegans* that are gray basally.

Means and ranges (in parentheses) of external and cranial measurements (in mm) of adult male ($n = 2$) and adult female ($n = 3$) *T. e. elegans*, respectively, are as follows: length of head and body, 132 (127–137), 119 (110–130); length of tail, 138 (129–146), 130 (127–133); length of hind foot 18 ($n = 1$), 17 (17); length of ear, 24 ($n = 1$), 23 (22–24); greatest length of skull, 33.2 (32.2–34.1), 30.2 (30.1–30.3); basal length, 30 (29.5–31.1), 28.2 (27.7–29); zygomatic breadth, 17.4 (16.9–17.8), 17.4 (16.8–17.8); palatal breadth, 17.1 (17–17.1), 16.2 (16.1–16.3); breadth of auditory bullae, 3.5 (3.4–3.6), 3.3 (3.2–3.3); length of nasals, 14.2 (13.7–14.7), 12.1 (11.8–12.3); length of mandible, 24.8 (23.9–25.7), 22.8 (22.4–23.4); length of the lower maxillary toothrow (M1–4), 6.7 (6.6–6.8), 6.5 (6.3–6.8—Tate, 1933). External and cranial measurements (in mm) for a single young adult female *T. e. coquimbensis* are as follows: length of head and body, 92; length of tail, 106; length of hind foot, 14; length of ear, 21; greatest length of skull, 27.1; palatal length, 24.3; zygomatic breadth, 14.6; palatal breadth, 14.4; breadth of auditory bullae, 3.3; length of nasals, 11; length of mandible, 19.9; length of the lower maxillary toothrow (M1–4), 6.4 (Tate, 1933).

DISTRIBUTION. *Thylamys elegans* occurs in the western flank of the Andes from Department of Ancash, Peru, southward to the Bío-Bío River in Chile (Fig. 3—Gardner, 1993; Tamayo and Frassinetti, 1980). The subspecies *T. e. soricina* Philippi, 1894 attributed to the southern region of Valdivia, is known from a single specimen captured in its type locality (Valdivia—Osgood, 1943;



FIG. 1. *Thylamys elegans* from Parque Nacional Fray Jorge, Coquimbo, Chile.



FIG. 2. Dorsal, ventral, and lateral views of skull and lateral view of mandible of an adult *Thylamys elegans* from Quebrada de La Plata, Santiago (male, Museo Nacional de Historia Natural, Santiago, Chile, no. 745). Greatest length of cranium is 30.5 mm. Photographs by H. Muñoz.

Tate, 1933; see Remarks). The nominative form *T. e. elegans*, occurs mainly along the Coastal Cordillera and adjacent areas in Chile, from the region of Tarapacá southward to the Bío-Bío River (Mann, 1978; Tamayo and Frassinetti, 1980). A specimen collected in Angol Province is "unmistakably *elegans* subspecies" (Tate, 1933:217). *T. e. coquimbensis* occurs in the transverse valleys of the regions of Atacama and Coquimbo, its type locality being Paiguano in the latter region (Mann, 1978). *Thylamys* from the eastern Andes (southern Bolivia and northwestern Argentina), recognized as *T. elegans* by Cabrera (1958) and Redford and Eisenberg (1992), is recognized by Palma (1994) as *T. venusta*—as proposed earlier by Tate (1933; see Genetics).

The northernmost range of *T. elegans* may be Chasquitambo, Department of Ancash, Peru (10°S—Handley, 1956). A specimen collected at this locality and described as *Marmosa* (*Thylamys*) *tatei*, Handley 1956, has subsequently been assigned to *T. elegans* (Gardner, 1993). The recognition of *T. elegans* at 10°S in Peru increases the range for this species by more than 1,600 km.

FOSSIL RECORD. Late Pleistocene-Holocene remains from caves in Lagoa Santa, Brazil, and Córdoba, Argentina, are referable to *Thylamys* (Reig et al., 1987). A lower jaw with M4 and M5 from the Pliocene (Monte Hermoso) was reported from beds at Río Quequen Salado, Buenos Aires Province, Argentina (Mones, 1980; Reig

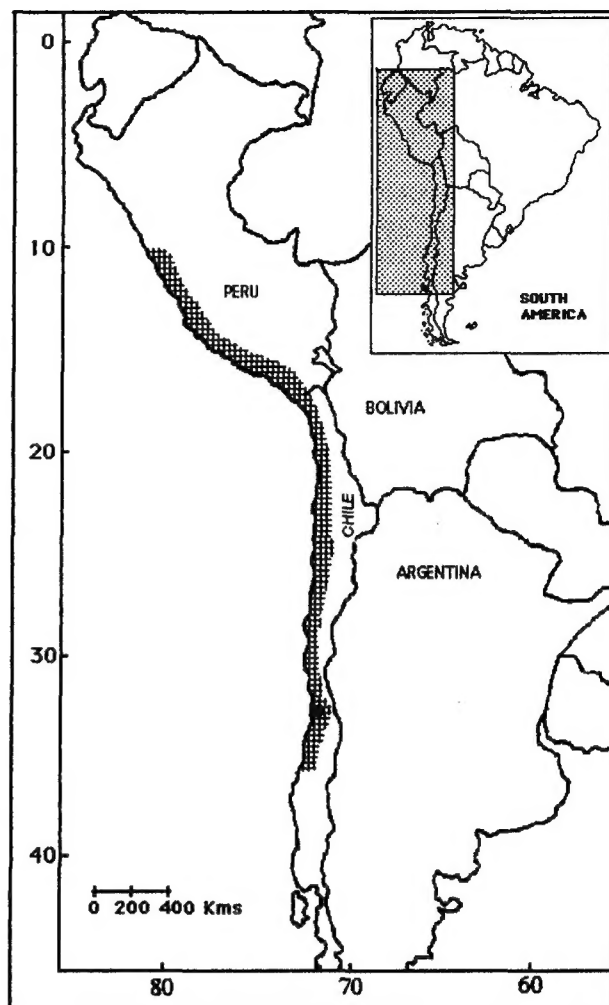


FIG. 3. Distribution of *Thylamys elegans* in Chile and Peru as proposed by Tamayo and Frassinetti (1980) and Gardner (1993). Black dot represents the type locality for the species.

et al., 1987). None of these fossils, however, have been identified as *T. elegans*.

FORM AND FUNCTION. *Thylamys elegans* has an uneven number of nipples: seven pectoral, one mid-abdominal, and seven postero-abdominal mammae, although only 11–13 nipples become functional (Mann, 1978; Tate, 1933). Females are pouchless, although some skin folds are formed around nipples during the reproductive season. *T. elegans* has an opposable thumb on the pes and a long and strong tail for climbing (Tate, 1933). Thickening of the tail has been observed during winter in *T. elegans*, allowing the species to store energy reserves (fat) for use during cold seasons when the species is in torpor (Bozinovic and Merritt, 1991; Mann, 1978). Swelling of the tail in *T. elegans* reaches its peak during the month of August (Tate, 1933).

The olfactory apparatus of *T. elegans* is well developed. The piriform lobe constitutes up to 50% of the cerebral hemispheres (Mann, 1978). Externally, a long and sharp snout with very extended nasal cavities is present (Mann, 1978). The vibrissae are long and well adapted as sensorial structures (Tate, 1933). Sight is also well developed as demonstrated by the size of the corpora quadrigemina; this is probably related to the crepuscular-nocturnal vision that is characteristic of marsupials (Mann, 1978).

The digestive tract is uncomplicated, with a small intestine, short colon, and a short cecum (Barnes, 1977). Teeth are sharp and adapted for gnawing and grinding. The dental formula is $i\ 5/4, c\ 1/1, p\ 3/3, m\ 4/4$, total 50 (Mann, 1944). Salivary glands (parotids and submaxillaries) are well developed, and their secretions facilitate the swallowing of the chitinous exoskeletons of prey (Mann, 1978). Physiological studies have shown that specimens from the

northern range of *T. elegans* (e.g., Region of Coquimbo) exhibit highly concentrated urine throughout the year, which is related to the limited availability of water (Cortés et al., 1994).

ECOLOGY. Testis and prostate gland increase in size in male *T. elegans* during the first year of life. During the breeding season, testes can measure up to 8 mm long (Mann, 1978). Ovulation in females also starts during the first year and is associated with a significant increase in size of the reproductive tract. Females produce one or two litters during the breeding season, which is from September to March. Litter size may be up to 17 embryos; number surviving will depend on the number of functional nipples, which for *T. elegans* is 11–13 (Mann, 1978).

Thylamys elegans occurs in several types of habitat in northern and central Chile, including relictual cloud forests and forest-brushy ecotones of the Region of Coquimbo (Fray Jorge National Park), northern and central part of the Coastal Cordillera, and the steppes of central Chile (Mann, 1978; Schamberger and Fulk, 1974). Abundance of *T. elegans* is low compared to coexisting sigmodontine rodents in areas of northern Chile (e.g., *Oligoryzomys*, *Phyllotis*—Fulk, 1975; Schamberger and Fulk, 1974). Abundance is higher in densely vegetated bushy areas than in open sites in central Chile (Jaksic et al., 1981). In northern semiarid Chile (Aucó Reserve, Coquimbo) the abundance of *T. elegans* is affected by climatic and density-dependent factors (F. J. Jaksic, pers. comm.). Individuals are mainly insectivorous with a high proportion of arthropods and insect larvae ($\leq 90\%$ by volume) in the diet, although fruit, small vertebrates, and even carrion are taken occasionally (Redford and Eisenberg, 1992). Diet varies with availability and abundance of food resources, however (Hunsaker, 1977; Meserve, 1981; Sabat and Bozinovic, 1994). In northern Chile, major predators of *T. elegans* are the burrowing owl *Athene cunicularia*, the great horned owl *Bubo virginianus*, and the culpeo fox *Pseudalopex culpaeus* (Jaksic et al., 1992, 1993).

Average home range size of *T. elegans* in southern Chile (Bío-Bío Region) is 1,383 m² in July and 781 m² in December (Muñoz-Pedreros et al., 1990). *T. elegans* builds nests of hairs and small pieces of leaves between rocks or in the foliage of trees (Mann, 1978). There are no records of occurrence of two adults in the same nest (Hunsaker, 1977). *T. elegans* also shelters in abandoned bird nests, under rocks or roots, and sometimes in holes dug in the ground by the caviomorph rodent *Cavia porcellus* (Nowak, 1991; Redford and Eisenberg, 1992).

GENETICS. The diploid number of chromosomes is 14 and the fundamental number is 20. Of the autosomes, six are large submetacentrics, two are medium-sized metacentrics, and four are small acrocentrics (Reig et al., 1972). The X chromosome is a small acrocentric or submetacentric, and the Y chromosome is a tiny acrocentric. The autosomic complement of *T. elegans* is similar to those reported for other species of *Thylamys* such as *T. pusilla* (Reig et al., 1977), *T. venusta* (Palma, 1994), and *T. macrura* (Palma, 1995).

Electron microscopic observations have demonstrated a direct relationship between the number of nucleolar organizing regions and their position in mitotic chromosomes and the number and position of nucleoli in the spermatocytes of *T. elegans* (Fernández-Donoso et al., 1979). The only nucleolar organizing region found in this species is located in a subterminal position in the C2 acrocentric pair (Reig et al., 1972), which is related to the single nucleolus found in the periphery of the nucleus in spermatocytes. Interestingly, the two nucleolar organizing regions located at subterminal positions in the microbiotheriid marsupial *Dromiciops gliroides* are associated with two nucleoli at the periphery of the nucleus (Fernández-Donoso et al., 1979).

A phylogenetic analysis of 26 enzymatic loci among different species of *Thylamys* showed low levels of polymorphism and heterozygosity in the genus, 3.84 (0.99 criterion) and 0.01, respectively (Palma, 1994). Populations of *T. elegans* from Chile had fixed allele differences in four loci (IDH-2, PEP-A, PEP-B, and ME-1) when compared to populations of *Thylamys* from Bolivia (Palma, 1994). Preliminary data on sequences of the mitochondrial DNA cytochrome *b* gene also suggest that what Cabrera (1958) considered the same species on both sides of the Andes (*T. elegans*) are two different taxa (Palma, 1994). These results support the recognition of Bolivian forms as *Marmosa* (*Thylamys*) *venusta* (Tate,

1933), and they dispute Cabrera (1958) who recognized the Bolivian populations as subspecies of *T. elegans*.

REMARKS. Based on morphological traits, the genus *Marmosa* Gray, 1821 was divided into five species groups: *murina*, *cinerea*, *noctivaga*, *microtarsus*, and *elegans* (Tate, 1933). Today these assemblages are recognized at the generic level based on morphological, serological, chromosomal, electrophoretic, and DNA analyses (Creighton, 1984; Gardner and Creighton, 1989; Kirsch and Palma, 1995; Palma, 1994; Reig et al., 1985, 1987). Initially, the proposed genus *Thylamys* included Tate's *elegans* and *microtarsus* groups (Reig et al., 1985, 1987). Later, the *microtarsus* group was proposed as the new genus *Gracilinanus* (Gardner and Creighton, 1989). Currently, five species are recognized in *Thylamys*: *T. elegans*, *T. pallidior*, *T. pusilla*, *T. velutinus*, and *T. macrura* (Gardner, 1993). However, recent phylogenetic analyses in *T. elegans* (Palma, 1994) confirmed the eastern forms as a different species, as proposed by Tate (1933), who recognized *Marmosa* (*Thylamys*) *venusta* Thomas, 1902 in the eastern Andes and *Marmosa* (*Thylamys*) *elegans* Gray, 1843 on the western side.

The subspecies *T. e. soricina* is known from a single young specimen described by Philippi in 1894, captured in Valdivia, southern Chile. There are no additional records of this form in the latter region or surrounding areas in this century; hence the occurrence of this taxon is dubious. Furthermore, there are no verifiable records of *T. e. soricina* south of the Bío-Bío River in Chile (Tamayo and Frassinetti, 1980). Specimens collected in several localities in the Province of Talca, Chile (Pine et al., 1979) and recognized as *T. e. soricina* are within the range of *T. e. elegans*, since those localities are ca. 300 km north of the southern limit of *elegans*. Mann (1978) considered *T. e. soricina* a synonym of *T. e. elegans*, and he extended the range of the latter southward to Valdivia.

The word *Thylamys* is derived from the Greek *thylas*, meaning pouch, and *mys*, meaning mouse (pouched mouse). The word *elegans* is Latin for elegant. Common names for *T. elegans* are yaca, llaca, "marmosa elegante," "marmosa chilena," and "comadreja" (Campos, 1996; Mann, 1978; Osgood, 1943; Redford and Eisenberg, 1992).

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